MATH-131 TEST 4 (Assignment sheet: 2.5-6.7)
SAMPLE 2014

100 points                                          NAME:_____

Show all work.  On problems where a check is *required*, you must show your check.

CIRCLE T FOR TRUE, F FOR FALSE. ( 2 POINTS EACH )

(T)  F   (1)  $3x^{\frac{1}{4}} = 3\sqrt[4]{x}$

(T)  F   (2)  $(4y)^{\frac{1}{5}} = \sqrt[5]{4y}$

T  (F)   (3)  $(a-b)^{\frac{1}{3}} = a^{\frac{1}{3}} - b^{\frac{1}{3}}$

T  (F)   (4)  $\sqrt{81} = \pm 9$.

T  (F)  (5)  $\sqrt{x^2+y^2} = x+y$        5.1  (T)        5.2  (F)

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Fill in the blank with the most appropriate, simplified answer. ( 2 points each)

(6)  $(-64)^{2/3} =$ __16__

(7)  $\left(\frac{16}{25}\right)^{-1/2} =$ __$\frac{5}{4}$__

(8)  $\sqrt[3]{3}\ \sqrt[4]{2} =$ __$\sqrt[12]{5184}$__

$3^{1/3}\,2^{1/4} = 3^{4/12}\,2^{3/12} = \sqrt[12]{81\cdot 64}$

(9)  $(5+\sqrt{y})^2 =$ __$25+10\sqrt{y}+y$__

(10)  $\sqrt[3]{400} = 2\sqrt[3]{50}$ __

$\sqrt[3]{8\cdot 50}$

(11)  $\frac{\sqrt{6}}{5\sqrt{2}} =$ __$\frac{\sqrt{12}}{10}$__

(12)  $\left(-3\sqrt{5}\right)^2 =$ __45__

(13)  $\sqrt[4]{2a^5} + 5a\sqrt[4]{2a} =$ __$6a\sqrt[4]{2a}$__

$a\sqrt[4]{2a}$

(14)  $(-16)^{3/2} =$ __undefined__

(not real - no using imaginary numbers for)

(15)  $\sqrt{27} - \sqrt{12} + 2\sqrt{75} =$ __$11\sqrt{3}$__

$3\sqrt{3} - 2\sqrt{3} + 10\sqrt{3}$

(16) Simplify:

(a)  $\frac{2+\sqrt{5}}{3-\sqrt{5}} \cdot \frac{3+\sqrt{5}}{3+\sqrt{5}}$

$\frac{6+5\sqrt{5}+5}{9-5}$

(2 points each)

(b)  $\frac{4}{\sqrt[3]{9y^5}} \cdot \frac{\sqrt[3]{3y}}{\sqrt[3]{3y}} = \frac{4\sqrt[3]{3y}}{\sqrt[3]{27y^6}}$

$\frac{4\sqrt[3]{3y}}{3y^2}$

**(17) Solve.**           (5 points each)

(a) $\sqrt{2x+1}+\sqrt{x+4}=3$

$(\sqrt{2x+1})^2=(3-\sqrt{x+4})^2$

$2x+1 = 9 - 6\sqrt{x+4}+x+4$

$(x-12)^2=(6\sqrt{x+4})^2$

$x^2-24x+144 = 36(x+4)$

$x^2 -60x = 0$

$x(x-60)=0$

$x=0, \; x=60$

must check
$x=0$

(b) $\sqrt[3]{4x-2}=8$

$(\sqrt[3]{4x-2})^3=(8)^3$

$4x-2 = 512$

$4x = 514$

$x = \dfrac{514}{4} = \dfrac{257}{2}$

Not a "must check"

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**(18) Factor completely:**        (2 points each)

(a) $12x^{-\frac{3}{4}} - 8x^{\frac{1}{4}}$

$4x^{-3/4}(3-2x)$

$\dfrac{4(3-2x)}{x^{3/4}}$

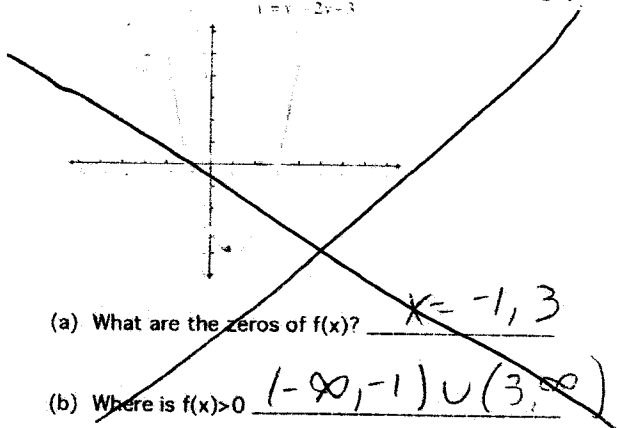(b) $5(4x+3)^{-1} - 4(5x+1)(4x+3)^{-2}$

$(4x+3)^{-2}\left( 5(4x+3)- 4(5x+1)\right)$

$(4x+3)^{-2}(20x+15 - 20x - 4)$

$\dfrac{11}{(4x+3)^2}$

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**(19) Use the graph of f(x) to answer the following questions:**     (2 points each)



(a) What are the zeros of f(x)?    $x=-1,3$

(b) Where is f(x)>0   $(-\infty,-1)\cup(3,\infty)$

⑲ $-3x^2-2x+4=0$

$-3\left(x^2+\dfrac{2}{3}x\quad\right)=-4$

$-3\left(x^2+\dfrac{2}{3}x+\dfrac{1}{9}\right)=-4-\dfrac{1}{3}$

$-3\left(x+\dfrac{1}{3}\right)^2 = -\dfrac{13}{3}$

$\left(x+\dfrac{1}{3}\right)^2 = \dfrac{13}{9}$

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**(20) Solve:** Express the answer using interval notation. No credit given without proper work shown.     (4 points each)

$x+\dfrac{1}{3}=\pm\dfrac{\sqrt{13}}{3}$

$x = -\dfrac{1}{3}\pm\dfrac{\sqrt{13}}{3}$

(a)    $3x^2 + 5x < 2$

$3x^2 + 5x - 2 < 0$

$(3x - 1)(x + 2) < 0$

$(-2, -1/3)$

(b)  $4 - 3(x-4) > 4$   OR   $3x > 2x + 4$

$4 - 3x + 12 > 4$        $x > 4$

$-3x + 16 > 4$

$-3x > -12$

$x < 4$

$(-\infty, 4) \cup (4, \infty)$

(21) For this problem only...do NOT assume all variables represent positive numbers.  Simplify.

(3 points each)

(a)  $\sqrt[4]{32a^{12}b^{13}} = 2b^3 \sqrt[4]{2b}$

$\sqrt[4]{16a^{12}b^{12} \cdot 2b}$

perfect 4ths

(b)  $\sqrt{63x^5y^9z^{10}} = 3x^2y^4z^5 \sqrt{7xy}$

$\sqrt{9x^4y^8z^{10} \cdot 7xy}$

(22)  Simplify.  Assume all variables represent positive real numbers.  (3 points each)

(a)    $\sqrt[4]{8x^6y^2} \; \sqrt[4]{2x^7y^6}$

$\sqrt[4]{16x^{13}y^8}$

$2x^3y^2 \sqrt[4]{x}$

(b)  $\sqrt[3]{\dfrac{32x^{13}y^3}{4xy^6}} = \sqrt[3]{\dfrac{8x^{12}}{y^3}} = \dfrac{2x^4}{y}$

(c)  $\dfrac{\sqrt{4x^5y}}{\sqrt{100x^{-3}y^2}} = \sqrt{\dfrac{x^8}{25y}} = \dfrac{x^4}{5\sqrt{y}} \cdot \dfrac{\sqrt{y}}{\sqrt{y}}$

$\dfrac{x^4\sqrt{y}}{5y}$

(d)  $\left(8a^6b\right)^{2/3}\left(a^2b^{3/2}\right)^2$

$8^{2/3}a^{6 \cdot \frac{2}{3}}b^{2/3}a^4b^3$

$4a^4b^{2/3}a^4b^3$

$4a^8b^{11/3}$       $\frac{2}{3} + 3 = \frac{11}{3}$

(e)  $\left(\dfrac{2x^{-1/5}y^{2/3}}{8x^{-1/4}y^{1/3}}\right)^2$

$\frac{1}{4} - \frac{1}{5}$

$\frac{5}{20} - \frac{4}{20}$

$\frac{1}{20}$

$\left(\dfrac{x^{1/4}y^{1/3}}{4x^{1/5}}\right)^2$

$\left(\dfrac{x^{1/20}y^{1/3}}{4}\right)^2 = \dfrac{x^{1/10}y^{2/3}}{16}$

(f)  $\sqrt[5]{-64x^{34}y^{12}z^{20}} = \sqrt[5]{-32x^{30}y^{10}z^{20} \cdot 2x^4y^2}$

perfect 5ths

$= -2x^6y^2z^4 \sqrt[5]{2x^4y^2}$

(23) For the function $f(x) = \sqrt{x-3}$,

a) Find the domain of f. ___ $X \geq 3$ ___    $X - 3 \geq 0$    (2 points)
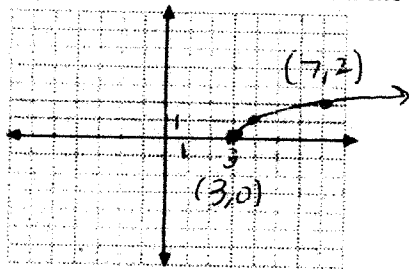                                                $X \geq 3$

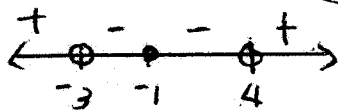b) Find f(x+h) = ___ $\sqrt{X+h-3}$ ___    (2 points)

c)) graph f(x) . Show scale and label two points on graph    (4 points)



(7, 2)
(3, 0)

(24) Solve. Express answer using interval notation.

(a) $\dfrac{(x+1)^2}{(x-4)(x+3)} \geq 0$



$+$    $-$    $-$    $+$
$-3$    $-1$    $4$

$(-\infty, -3)$ $(4, \infty)$ and $X = 1$

(d) $|2x+5| - 4 \leq 3$

$|2x+5| \leq 7$

$-7 \leq 2x+5 \leq 7$

$-12 \leq 2x \leq 2$

$-6 \leq X \leq 1$

$[-6, 1]$

(24)

(18) Solve each of the following and simplify your answer:

(a) $5x^2 = 1-3x$

$5x^2 + 3x - 1 = 0$

$x = \dfrac{-3 \pm \sqrt{9+20}}{10} = \dfrac{-3 \pm \sqrt{29}}{10}$

(b) $x^2 + 4x + 9 = 0$

$x = \dfrac{-4 \pm \sqrt{16-36}}{2} = \dfrac{-4 \pm \sqrt{-20}}{2}$

$= \dfrac{-4 \pm i\sqrt{20}}{2} = \dfrac{-4 \pm 2i\sqrt{5}}{2}$

$= -2 \pm i\sqrt{5}$

(c) $x^2 \left( \dfrac{2}{x^2} - \dfrac{14}{x} + 24 = 0 \right) x^2$

$2 - 14x + 24x^2 = 0$

$2(12x^2 - 7x + 1) = 0$

$2(3x-1)(4x-1) = 0$

$x = 1/3, 1/4$

(d) $(x-3)(x+1) = 2$

$x^2 - 2x - 3 = 2$

$x^2 - 2x - 5 = 0$

$x = \dfrac{2 \pm \sqrt{4+20}}{2} = \dfrac{2 \pm \sqrt{24}}{2}$

$= \dfrac{2 \pm 2\sqrt{6}}{2} = 1 \pm \sqrt{6}$

(e) $2x^2 + 5x^{-1} - 3 = 0$

let $x^{-1} = u$

$2u^2 + 5u - 3 = 0$

$(2u - 1)(u + 3) = 0$

$u = 1/2, -3$

$\dfrac{1}{x} = \dfrac{1}{2} \qquad \dfrac{1}{x} = -3$

$x = 2 \qquad x = -1/3$

(f) $(1-3x)^2 = -4$

$1 - 3x = \pm\sqrt{-4} = \pm 2i$

$-3x = -1 \pm 2i$

$x = \dfrac{-1 \pm 2i}{-3}$